St. Petersburg State University
Graduate School of Management

Master in Corporate Finance

INTELLECTUAL CAPITAL AND FIRM PERFORMANCE IN RETAIL INDUSTRY

Master's Thesis by the 2nd year student
Concentration – Master in Corporate Finance
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АННОТАЦИЯ

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Описание цели, задач и основных результатов	Цель: Определить характер взаимосвязи между Интеллектуальным Капиталом (ИК) и его компонентами и показателями деятельности компании, которые включают валовую прибыль, рентабельность инвестиций и продажи на одного сотрудника. Задачи: • Изучить определение ИК и его компонентов, используя предыдущие исследования; • Изучить и сравнить методологии измерения ИК и выбрать наиболее подходящие в соответствии с целью исследования; • Провести краткий обзор индустрии ритейла и ее тенденций; • Определить показатели эффективности розничной торговли и выбрать те, которые могут иметь отношение к ИК фирм; • Провести эмпирическое исследование для выявления взаимосвязи между ИК и показателями эффективности розничных компаний из США. Основные результаты: В ходе исследования была выявлена положительная взаимосвязь между компонентами IR и производительностью компаний, также были прокомментированы полученные результаты. Кроме того, по результатам эмпирического исследования были сформулированы управленческие рекомендации.

Ключевые слова	Интеллектуальный Капитал, Человеческий Капитал, Структурный Капитал, Потребительский Капитал, показатели эффективности, валовая прибыль, рентабельность инвестиций, продажи на одного сотрудника.

ABSTRACT

Master student's name	Sergey Vologzhanin
Master thesis title	Intellectual Capital and Firm Performance in Retail Industry
Faculty	Graduate School of Management
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Academic advisor's name	Marat V. Smirnov
Description of the goal, objectives and main results	Goal: To identify the nature of relationship among the Intellectual Capital (IC) and its components and company's performance indicators, which include Gross Margin, Return on Investments and Sales per Employee. Objectives: • to examine the definition of Intellectual Capital and its components, using the previous researches; • to study and compare methodologies of IC measurement and opt for the most applicable according to the purpose of the study; • to conduct a brief review of the Retail industry and its trends; • to identify performance indicators of the Retail industry and choose those which might have a connection to a IC of a firm; • to provide an empirical investigation to capture the relationship among IC and performance indicators of US Retail firms. Main results: The research revealed the positive relationship among IC components and company's performance and the obtained results were discussed. In addition, managerial implications were stated according to the results of empirical research.
Keywords	Intellectual Capital, Human Capital, Structural Capital, Relational Capital, performance indicators, Gross Margin, Return on Investments, Sales per Employee.

ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

Я, Вологжанин Сергей Олегович, студент второго курса магистратуры направления «Менеджмент», заявляю, что в моей магистерской диссертации на тему «Интеллектуальный капитал и эффективность компаний в розничной торговле», представленной в службу обеспечения программ магистратуры для последующей передачи в государственную аттестационную комиссию для публичной защиты, не содержится элементов плагиата.

Все прямые заимствования из печатных и электронных источников, а также из защищенных ранее выпускных квалификационных работ, кандидатских и докторских диссертаций имеют соответствующие ссылки.

Мне известно содержание п. 9.7.1 Правил обучения по основным образовательным программам высшего и среднего профессионального образования в СПбГУ о том, что «ВКР выполняется индивидуально каждым студентом под руководством назначенного ему научного руководителя», и п. 51 Устава федерального государственного бюджетного образовательного учреждения высшего профессионального образования «Санкт-Петербургский государственный университет» о том, что «студент подлежит отчислению из Санкт-Петербургского университета за представление курсовой или выпускной квалификационной работы, выполненной другим лицом (лицами)».

_____ (Подпись студента)

24.05.18

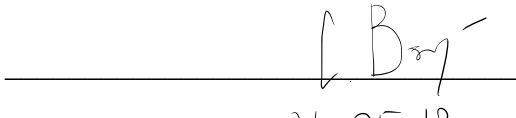
_____ (Дата)

STATEMENT ABOUT THE INDEPENDENT CHARACTER OF THE MASTER THESIS

I, Sergey Vologzhanin, second year master student, program «Management», state that my master thesis on the topic « Intellectual Capital and firm performance in retail industry », which is presented to the Master Office to be submitted to the Official Defense Committee for the public defense, does not contain any elements of plagiarism.

All direct borrowings from printed and electronic sources, as well as from master theses, PhD and doctorate theses which were defended earlier, have appropriate references.

I am aware that according to paragraph 9.7.1. of Guidelines for instruction in major curriculum programs of higher and secondary professional education at St. Petersburg University «A master thesis must be completed by each of the degree candidates individually under the supervision of his or her advisor», and according to paragraph 51 of Charter of the Federal State Institution of Higher Professional Education Saint-Petersburg State University «a student can be expelled from St. Petersburg University for submitting of the course or graduation qualification work developed by other person (persons)».



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24.05.18

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INTRODUCTION

Nowadays, the importance of knowledge assets in organizations is rising. Intellectual capital, human capital, knowledge-based resources, information assets, knowledge management, intangible assets are the new forms of economic value. Although, the significance of intellectual capital (IC) has increased greatly in the last decades, the majority of organizations do not properly manage IC due to measurement difficulties. Many scholars have argued that IC, which is characterized by intangible assets such as employee knowledge, skills, organizational routines and procedures, has become the preliminary source of competitive advantage for a company. But not only IC gives a competitive advantage to a company it also creates value for it. Therefore, it is intuitively expected that the efficiency of IC measurement and management has a direct influence on a performance of firms, thereby constituting an issue of practical interest to managers and an important area of a research.

The rising importance of knowledge assets is happening due to the shift of economically advanced countries into the "information society" or the "information age". Through this shift, the role of information and intelligence, embodied in both people and smart machines, becomes pervasive. The newly-formed knowledge-based society is characterized by an application of digital technologies through all aspect of its lives. This application is sometimes called the "digital transformation". However digital technologies integrate not only into people's lives, but also into various areas of businesses. In some cases, rapid growth of digital technologies may lead to industry disruption. One of such industries which is going through disruption and which lays in the area of my interest is Retail.

There are a lot of studies devoted to a relationship between IC and a firm performance and scholars employ different IC measurement tools since there is no universally accepted method of IC measurement. The abundance of IC valuation methods and the absence of the universal method make quantitate testing of the relationship challenging. Moreover, there are no studies devoted to the examination of relationship between IC and firm performance in Retail industry.

Taking into account the importance of IC measurement and the lack of studies devoted to IC within a rapidly changing Retail business, the purpose of the study is formulated as "to examine the nature of relationship between IC and performance of firms in Retail industry".

The format of the research is an empirical study. The **research gap**, which had been identified through the review of the literature, is the lack of empirically supported factors identifying the type of impact of IC on firm performance in Retail industry which is subject to

great and impressive technological shifts. These factors of influence could be efficiently utilized by managers of retail firms for value creation purposes and as drivers of performance. In the current study, the **object** of the research is the largest General and Food and Drug Retailers from the US which are included in the top 250 Retail firms according to Deloitte report (2017). The **subject** of the study is a relationship between Intellectual Capital and performance of studied companies.

Accordingly, several econometric models are composed and used with the purpose of conducting an empirical analysis. In models, retail performance indicators are employed as dependent variables.

A research goal of the master thesis is to identify the nature of relationship among the IC and its components and company's performance indicators, which include Gross Margin, Return on Investments and Sales per Employee.

In order to achieve the goal the following **research objectives** were identified:

- to examine the definition of Intellectual Capital and its components, using the previous researches;
- to study and compare methodologies of IC measurement and opt for the most applicable according to the purpose of the study;
- to conduct a brief review of the Retail industry and its trends;
- to identify performance indicators of the Retail industry and choose those which might have a connection to a IC of a firm;
- to provide an empirical investigation to capture the relationship among IC and performance indicators of US Retail firms.

During the research, different information sources were used to conduct literature review and quantitative analysis. Preliminary sources for literature review were published articles by Russian and foreign scholars. Mainly, I examined articles from EBSCO, Elsevier, Emerald Insight, SCOPUS. The quantitative analysis was based on a data from the Thompson Reuters databases.

The thesis is divided into two parts: theoretical and empirical and include two chapters. The first chapter of the thesis consists of the definition of IC and its three components, the examination of existing methodologies of IC measurement and of the brief overview of Retail industry and its trends. Moreover, the first chapter includes the justification of performance indicators within the Retail business, an overview of the examined literature and the formulation of research hypotheses. In the first part of the second chapter, the methodology of the analysis is

presented. In the following part, the description of the data and regression analysis are conducted and in the last part of the study, the discussion of the results is presented.

The content of the theoretical part of the research include the examination of the existed classification of IC elements, namely Human capital, Relational capital and Structural capital. This classification is based on most cited articles devoted to the field of IC. Besides the definition of IC, the main methodologies of IC measurement are studied and compared and the Valued Added Intellectual Coefficient (VAIC) is chosen as the best tool for a statistical analysis. In the following part of the theoretical review the overview of Retail industry and its trends are presented and performance indicators within the Retailing are investigated. Three indicators: Gross Margin, Return on Investments, Sales per Employee are selected for the following quantitative analysis of a relationship with firms' IC. The main outcomes of the first part of the research is the selection of the most practical IC measurement tool and of the most appropriate performance indicators, moreover, the other important outcome is the characterization of the potential relationship between the IC of firms and dependent variables in the form of hypotheses statement.

The empirical part consists of an empirical research which include a regression analysis of the relationship between VAIC and its parts and the selected performance indicators. Five main hypotheses are formulated and tested and the relationship and characteristics of this relationship are identified.

An observed sample consists of 33 largest US retail companies which relate to two main categories General retailers and Food and Drug retailers and several subcategories such as Supermarkets, Discounters, Apparel retailers etc. The methodology for the sample selection was taken from the Deloitte report.

As a result, the existence of positive relation among IC components and company's performance was identified and the results were discussed. In addition, managerial implications were stated according to the results of empirical research.

CHAPTER 1. LITERATURE REVIEW

1.1. Definition of Intellectual Capital and its components

A competitive advantage of a firm and its success is tightly connected with the ability of a firm to be innovative. One of the definitions of innovation is a process of implementing new ideas and practices that helps a company to create value. In this case, traditional resources such as fixed assets are becoming of less importance than knowledge-based resources when they are employed for reaching competitive advantage (Carmona-Lavado *et al*., 2010). The knowledge-based capital is also known as Intellectual Capital (IC) and it represents the sum of all the knowledge or information within a firm that gives it a competitive edge. People and their knowledge, ability to innovate, expertise, organizational culture and other intangible assets have been widely demonstrated to be the most important asset for a company's development.

Intellectual Capital has various definitions among the academia where most scholars employ the concept of IC for the disclosure of intangible assets. The term intangibles or intellectual capital refers to knowledge of a firm. In 1969 first concept of Intellectual Capital was proposed by John Kenneth Galbraith. Hall (1992) identified intangible resources as "assets" or "skills" which include intellectual property rights, reputation, know-how of employees and indicated that these assets serve as a value-driver for a company. Edvinsson and Malone (1997) claimed that IC plays a major role in corporate performance and firm value-creation. Sveiby (1997) provided brief but at the same time clear definition of IC named it an "useful package of knowledge" which include organizational processes, patents, employee skills, information about customers, suppliers and business partners. Brookings (1997) stated that IC contain assets based on market knowledge, knowledge of human capital and intellectual property. Stewart (1998) defined IC as the sum of everything everybody in a company knows that gives it a competitive edge, expanding this definition further as: IC is intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth. Sullivan (2000) offered a powerful explanation of IC defining it as a knowledge that could be transformed into profit. With its definition, Sullivan touches the core of IC, its ability to influence corporate performance when properly maintained by managers. Another interesting meaning was presented by Lev (2001), who defined IC as claims for future benefits that do not have a physical or financial embodiment and which could be obtained by proper end efficient employment of IC. In accordance with Marr and Schiuma (2001, cited in Marr 2004) IC represents a collection of knowledge assets that are attributed to an enterprise and most considerably contribute to an improvement of a competitive position of this firm by enhancing value to stakeholders. Volkov

and Garanina (2007) define IC as any asset which is owned by a company and has no physical or financial form, but capable of producing future economic benefits. In one of the most recent articles, Hsu and Fang (2009) gave the following definition of IC: Intellectual Capital represents the total liabilities, employee knowledge, culture, strategy, process, intellectual property, and relational networks of a firm. These intangible assets, according to authors, create value or competitive advantages and help a company in achieving its goals.

Though in the ensuing years, there have been many attempts to expand or clarify the definition of IC, a considerable number of scholars and practitioners decompose IC into three main components: human capital, structural capital and relational capital (Bontis, 1996; Edvinsson and Malone, 1997; Stewart, 1997; Sveiby, 1997; Yang and Lin, 2009).

Human Capital.

A term Human Capital was popularized by Gary Becker, an economist and Nobel Laureate and Jacob Mincer, a labor economist, they both recognize the importance of human expertise. Becker stated that "expenditures on education, training, medical care are investments in capital. All of these investments produce human capital since you cannot isolate a person from his or her knowledge, skills, health, or values the way it is possible to move financial or physical assets while the owner stays put (Becker, 1964, p. 16). Human capital is an unsafe asset because it cannot belong to the firm, so if employees leave the company, the company could lose its human capital (Edvinsson, 1997). Human Capital consist of two parts – a broad and a more specific. The broad definition is a wide human resource considerations of the business labor force and the more specific one is requirements of personal expertise in the form of knowledge, skills, and qualities of the staff (McGregor *et al*., 2004). Bontis (2001) indicated that the human capital is highly influential since it is a source of innovation and renewal for a company.

Structural Capital.

Structural Capital is an infrastructure within an organization which fulfils the function of supporting employees in reaching optimum intellectual performance and therefore overall business performance (Bontis, 1998). If such non-physical infrastructure is poor, a highly skilled employee will not be able to reach its full potential. Structural capital might include patents, organizational processes, software, and databases. Due to its diverse components, structural capital could be categorized into organizational, innovation and process capital. Organizational capital contains an organizational philosophy and systems that improve organizational capacity. Process capital consists of methods, programs and procedures that implement and improve the provision of goods and services. Innovation capital comprises a number of protected commercial rights such as patents, trademarks and copyrights.

According to Chen et al., (2004) even though, structural capital is influenced by human capital, it exists independently of human capital. All in all, structural capital is a vital link which permits intellectual capital to be valued at an organizational level.

Relational Capital.

Relational Capital which is sometimes called customer capital, is a third component of IC. It is defined by Marti (2001) as the organization's ability to positively engage with members of the business environment to stimulate value creation potential by increasing human and structural capital. The essence of Relational capital is knowledge embedded in relationships external to a firm (Bontis, 2001). Relational capital contains the following elements: reputation, brand, customer loyalty, long-term customer relations, trade names and distribution channels.

Breaking IC into components (human, organizational and relational capital) is helpful for better understanding of this complex intangible asset and it is a preliminary step for IC measurement. IC measurement is significant to IC management, in other words efficient management relies on effective measurement. A number of scholars agreed that the creation of a competitive advantage and a value for a company is highly dependent on an efficient employment of IC. (Edvinsson and Malone, 1997; Sveiby, 1997; Guthrie, 2001; Chen *et al*., 2005; Diez *et al*., 2010). Moreover, by bringing an additional economic value for a firm, efficient management of IC positively influences company's performance (Marr and Roos, 2005).

An overview of the components of IC and its structure:

Human Capital	Relational Capital
capability of a company to benefit from knowledge, skills and experience of employees, which immanently pertain to the latter. These knowledge, skills and experience include in particular: - capability for innovations, - creativity, - know-how and experience, - ability to work in a team, - motivation, - learning capability, - educational and professional level etc.	capability of a company to benefit from resources connected with the company's external relations (with customers, suppliers, and other counteragents). Such resources include: - brands, - suppliers, - loyalty of customers, - distribution channels - business cooperation, - alliances and partnerships, - licensing/franchising agreements etc.

Organizational (Structural) Capital	
capability of a firm to benefit from attainments remaining inside the company. Such attainment may refer to:	
Intellectual Property:	*Infrastructural Assets:*
- patents, - trademarks, - service marks - copyright, - other sole rights	- corporate culture, - information systems, - databases, - management philosophy, - decision-making system etc.

INTELLECTUAL CAPITAL

Figure 1 Intellectual Capital structure[*]

1.2. Measurement of Intellectual Capital (valuation methods and models)

The broad acknowledgement of IC as a source of competitive advantage led to the emergence of various methods of IC measurement, since traditional financial techniques were not being able to cover all of its aspects. Basing on the works of Luthy and Williams, Sveiby (2001) classifies IC measurement approaches into four main categories:

- **Direct Intellectual Capital methods (DIC).** Assesses the monetary value of intangible assets by determining its different parts. When these parts are specified, they can be measured either separately or as an aggregated ratio. DIC includes: The Value Explorer, Intangible Assets Valuation, Accounting for the Future, Inclusive Valuation Methodology, Total Value Creation, Technology Broker.

  Scorecard methods (SC). This method helps to identify various components of

[*] Source: Volkov, Dmitry L., and Tatiana A. Garanina. "Intellectial capital valuation: Case of Russian companies." (2007).

intangible assets through the creation of indicators and indexes, and disclosure of these indicators in the evaluation card or in the form of graphs. It is the only non-monetary method. SC includes: Balanced Scorecard, Intangible Assets Monitor, IC-Rating, Skandia Navigator, Holistic Approach Value.

- **Market Capitalization Methods (MCM).** MCM method is the difference between the Market and the Book value of companies. It evaluates the monetary value of intangibles. MCM includes: Tobin's Q, Calculated Intangible Value, Ratio of market value to book value (MV/BV), Investor Assigned Market Value (IAMV), FiMIAM.
- **Return on Assets methods (ROA).** Under this method, tangible assets and annual growth rates are compared to industry averages. Profit that occurred above average, then used to estimate the value of intangible assets. ROA includes: Economic Value Added (EVA), Market Value Added (MVA), Value Added Intellectual Coefficient (VAIC), Knowledge Capital Earnings.

Four proposed models are arranged in a form of a table in which their strengths and weaknesses are identified:

Table 1

IC valuation methods

Method	Form	Level of measurement	Strengths	Weaknesses
SC	Non-monetary	Micro-level	More comprehensive overview of an IC than those of monetary methods Could be applied to any level of organization	Indicators are contextual thus should be customized for each organization individually Useless for comparison Difficult to obtain numeric result
DIC	Monetary	Micro-level	Provides a comprehensive overview of an IC Allows separate measurement of IC elements	Indicators are contextual thus should be customized for each organization individually Useless for comparison
MCM	Monetary	Macro-level	Useful for comparison and benchmarking Indicate financial value of IC Evaluations are easy to understand	Is not suitable for an overview of the development of IC Only economic focus may limit the full perspective on IC

ROA	Monetary	Macro-level	Useful for comparison and benchmarking Indicate financial value of IC Evaluations are easy to understand Based on traditional accounting rules	Only economic focus may limit the full perspective on IC

As we can see from the table each method has its positive as well as negative perspectives but the most vital aspects for quantitative testing is the availability of monetary form of the method as well as the capability of comparison. Both these two capabilities have only Market Capitalization Methods and Return on Asset methods. The most widely used evaluation models within MCM are: Tobin's Q (Luthy, 1998); Calculated Intangible Value (Stewart, 1997); Market-to-Book value (various authors).

Tobin's Q. James Tobin, a Nobel laureate in economics developed a measure – Q, which helps to predict investment decisions. Tobin's Q is a ratio between a physical asset's market value and its replacement value. This ratio was not developed as an IC measure, but former Federal Reserve chairman Alan Greenspan has noticed that high Q and market-to-book ratios express the cost of investments in technology and human capital (Stewart, 1997). Changes in Q provide a proxy for measurement whether a firm effectively employ its IC.

An equation for calculating Tobin's Q ratio:

$$Q\ Ratio = \frac{Total\ Market\ Value\ of\ Firm}{Total\ Asset\ Value}$$

Where IC is represented as: Intellectual Capital = Market Value – Replacement Cost of Tangible Capital

If Q > 1 and is greater than the Q of competitors, than the company has an ability to accumulate higher profits than other firms from the same industry. And among the elements that affect Q, there may be IC and other intangible assets of the firm.

Calculated Intangible Value. This model was developed by Stewart (1997) to measure IC to help investors and decision makers appraise the value of knowledge-intensive firms. The underlying assumption behind CIV is that investments in physical assets can only yield the average return dominant in the industry; anything above average return is explained by the

efficient use of intellectual capital. Stewart argued that a portion of the firm's profits surpassing the average profits in the firm's sector is a product of intellectual capital.

The calculation of CIV consists of seven stages:

1. Calculation of average pre-tax earnings of a firm for the last three years. Let it be (a).
2. Calculation of average year-end tangible assets of a firm for the last three years. (b)
3. Calculation of ROA (return on assets) by dividing average pre-tax earnings by average year-end tangible assets of a firm. Let ROA be (c), then (c) = *(a)/(b)*.
4. Calculation of industry ROA according to the same technique. If $ROA_{company} > ROA_{industry}$, proceed to stage 5. Let $ROA_{industry}$ = (d).
5. Calculation of an excess return of a firm - (e). It is calculated by multiplying $ROA_{industry}$ (d) by tangible assets of a firm (b) and then the quotient is subtracted from pre-tax earnings (a). (e) = (*a)-(d*b)*.
6. Calculation of after-tax excess return of a firm. It is estimated by computing the three-year average corporate tax rate and then subtracting this number from 1. Then multiply it by the company's excess return. After-tax excess return = *(a-d*b)* * (*1- average corporate tax rate)* and this excess return is a result of IC of a firm.
7. Calculation of the Net Present Value of the after-tax excess return of a firm, where the discounting factor is the cost of capital of a firm. After-tax excess return is divided by cost of capital. NPV of after-tax excess return represents IC of a firm.

Market-to-Book value. The market-to-book ratio assumes that the approximate value of a company (tangible assets plus intangibles) is determined by its market value – the market price per share of ordinary shares multiplied by the number of shares outstanding. Thus, the difference between the book value from the balance sheet of a firm and the market value gives an approximate estimate of the IC, which is part of the total value of the company that is not shown on the balance sheet. The greater the difference between book value and market value, the more knowledge-intense the firm is, and the higher the IC value in this firm (Stewart, 1997).

An equation for calculating Market-to-Book value:

$$M/B\ value = Total\ Book\ Value - Total\ Market\ Value$$

Where IC is represented as: Intellectual Capital = Market Value – Book Value

The most widely used evaluation models within ROA include: Economic Value Added (EVA) and Market Value Added (MVA) (Bontis *et al*., 1999); VAIC model (Pulic, 1998, 2000).

EVA. Economic value added was first introduced by Stewart in the late 1980s as a tool to help businesses comply with their main financial Directive, helping to maximize the wealth of their shareholders (Stewart, 1994). EVA is a comprehensive performance measurement tool that uses capital budgeting, financial planning, goal setting, performance measurement, shareholder communication and compensation incentives to properly account for all the ways an organization's value can be added or lost (Bontis *et al*., 1999). Stewart described EVA as the difference between company's net operating income after taxes and its cost of capital both equity and debt (Chan and Dodd, 2001).

An equation for calculating EVA:

$$EVA = Residual\ Income\ (RI) + Accounting\ Adjustments\ (AcctAdj)$$

Where:

RI = Net Operating Profits After Taxes (NOPAT) – Capital Charge (CapChg);

NOPAT = Earnings Before Extraordinary Items (EBEI) + After Tax Interest (ATInt);

EBEI = Cash Flow from Operations (CFO) + Accurals;

ATInt = Net Interest Expense x (1 – Tax Rate);

CapChg = the charge for use of capital. It includes interest on the debt plus a charge for the equity capital based on a cash equivalent equity multiplied by a cost of equity.

Thus, the purpose of EVA calculation is to obtain earnings close to cash and compare this return to a capital base, which is also expressed in cash equivalent.

MVA. Market value added is the difference between the market value of a company (both equity and debt capital) and the capital that creditors and shareholders have appropriated to it over the years in the form of loans, retained earnings and paid-up capital. Thus, the MVA is a measure of the difference between "cash in" (what investors have contributed) and "cash out" (what they could get by selling at today's prices). If the MVA higher than zero, it implies that the firm has enlarged the value of the capital entrusted to it and thus created the wealth for shareholders. If the MVA less than zero, the firm has decreased or demolished the shareholder's wealth (*Performance Rankings*, 1999).

By increasing the spread, managers increase the welfare of shareholders in comparison with other capital users (Bontis *et al*. 1999).

An equation for calculating MVA:

$$MVA = Market\ Value\ of\ Debt + Market\ Value\ of\ Equity - Total\ Adjusted\ Capital$$

Where:

Market Value of Debt = Total Outstanding Debt ∗ Market Value of Debt;

Market Value of Equity = Total Number of Outstanding Shares ∗ Share Price;

Total Adjusted Capital is the balance sheet total adjusted for a certain accounting features, such as LIFO reserve, notes payable, present value of operating leases, deferred taxes and the total amount of goodwill expensed to date, using both an operating and financing approach (Evans, 1999).

Where IC is represented as: Intellectual Capital = Market Value – Book Value

In order to get comparable MVA, a standardized MVA is estimated by dividing the change in MVA by the adjusted equity value at the beginning of the year (Evans, 1999).

An equation for calculating standardized MVA:

$$Standardized\ MVA = Change\ in\ MVA\ for\ a\ year / Adjusted\ Equity\ at\ Beginning\ of\ Year$$

Value Added Intellectual Coefficient. The VAIC model was established by Ante Pulic (1998, 2000). He was one of the first scientists in IC research to focus directly on the relationship between IC and economic activity and the first to base his analysis solely on company balance sheet data (Stahl et al., 2011). As stated by Pulic (2000): VAIC was designed to assist managers in employment of potential of their company and is based on current business results. VAIC provides information on the effectiveness of the creation of the value of tangible and intangible assets. This model estimates the value of human capital (HC) and structural capital (SC) within a firm's IC. VAIC also includes capital Employed (CE), which indicates the effectiveness of the physical and financial capital of the organization. The VAIC model is designed to measure the extent to which a company produces added value based on intellectual (capital) efficiency or intellectual resources (Stahl et al., 2011). VAIC calculations are based on:

- Human Capital (HC), which is mainly interpreted as employee costs;
- Structural Capital (SC), which is interpreted as the difference between produced Value Added (VA) and Human Capital (HC), i.e. $SC = VA - HC$;
- Capital Employed (CE), which is interpreted as financial capital, e.g. book value.

Based on these definitions and assumptions, the VAIC is calculated as a direct sum of key efficiency figures, which in turn are calculated as ratios:

- Capital Employed Efficiency (CEE) = VA/CE;
- Human Capital Efficiency (HCE) = VA/HC;
- Structural Capital Efficiency (SCE) = SC/VA.

An intermediate result is the estimation of Intellectual Capital Efficiency:

$$ICE = HCE + SCE$$

The last step is a calculation of VAIC:

$$VAIC = ICE + CEE$$

Thus, VAIC is a relational index in which the value added produced is compared with the capital employed and human capital (i.e. with the cost of workers). When structural capital is zero (or negative), the VAIC can take zero (or negative) values.

3 stages of VAIC calculations:

(1) The first stage a determination of how a firm creates Value Added (VA), which is, in other words, the difference between output and input:

$$VA = OUT - IN$$

or

$$VA = OP + EC + D + A$$

Where:

OP = Operating Profit

EC = Employee Costs

D = Depreciation

A = Amortization

According to the model, a firm's Human Capital (HC) is equivalent to its Employee Costs (HC = EC), which are calculated from the total wage costs. Structural Capital (SC) equals to the difference between the firm's previously calculated VA and its HC:

$$SC = VA - HC = OP + D + A$$

(2) Next step is calculation of the capital employed efficiency (CEE) of a firm, its human capital efficiency (HCE) and its structural capital efficiency (SCE). The CEE defines how much value is created in one monetary unit invested in financial or physical capital. The CEE of a company is obtained by dividing its value added (VA) by its capital employed (CE). $CEE = VA/CE$. HCE, respectively describes how the company creates through one monetary unit invested in its human resources. HCE is obtained by dividing a company's value added (VA) by its human capital (HC). $HCE = VA/HC = (OP + EC + D + A)/HC$. With SCE, you can get information about how much capital a company can create through structural capital (SC) and it is calculated by dividing the company's SC by its VA: $SCE = SC/VA$.

(3) Within the third step, a firm's intellectual capital efficiency (ICE) and its value added intellectual coefficient (VAIC) are calculated. A company's ICE is obtained by adding its human capital efficiency (HCE) and structural capital efficiency (SCE): $ICE = HCE + SCE$. A firm's ICE is acquired by adding its intellectual capital efficiency (ICE) and capital efficiency (CEE): $VAIC = ICE + CEE$ and it denotes how much value the company creates in total per monetary unit invested for each resource (in the area of capital).

The following table summarizes strengths and weaknesses of the six most widely used models of IC measurement which are included into two selected IC valuation methods – Market Capitalization Methods (MCM) and Return on Assets (ROA) methods:

Table 2

IC valuation models

Model	Method	Advantages	Disadvantages
Tobin's Q	MCM	Applicable for intra-industry comparison Offers a global view	The value of IC is imprecise since Q is subject to other variables such as market speculation Depends on the market
CIV	MCM	Simplicity of calculations All the data could be obtained from financial statements Appropriate for comparison	Heavily relies on ROA which might be overestimated or underestimated The method is not applicable to industries where the mean value of the industry ROA is determined by a small number of companies (Nayak et al., 2008)

			The CIV model assumes that a company's after-tax excess return is a result of its intellectual capital. There are many factors that contradict this assumption The level of excess return is also affected by other (intangible) factors such as the firm's financial position and market structure. They may or may not be associated with intellectual capital. The CIV method of calculation is an aggregate factor that does not allow to identify individual components in intangible assets (Volkov and Garanin, 2007) It is difficult to determine the ratio of the weighted average cost of capital, though this element is required for CIV computations (Volkov and Garanina, 2007)
M/B value	MCM	Relatively stable May be applied even if the results are negative Easy in calculations	Does not provide the exact value of IC Stock prices are affected by many economic factors not associated with a company's intangible assets Sensitive to accounting standards This method simplifies the value of IC Market-to-book value uses information about past and present, whereas intellectual capital relates largely to the future (İşeri and Kayakutlu 2003, 90).
EVA	ROA	Easy to use Appropriate for comparison	Does not consider future performance Business profitability has to be higher than the financing costs Is a historical measure thus it does not

			provide the connection between the company's investments in intangibles and financial performance More of a measure of a financial feature and attributing changes in them to the efficiency in the deployment of intellectual capital resources The starting point for EVA analysis assumes that companies should be run in the interest of shareholders exclusively. In sum, the EVA performance measure may not be appropriate when applied to quantifying the value of intangible assets. (Bontis, 2001)
MVA	ROA	Incorporates expectations of the sector	Not valid for companies not listed on a stock exchange
VAIC	ROA	Provides useful information for stakeholders, managers and investors A detailed method which evaluates separately Human capital and Organizational capital of IC VAIC metrics could be used for measuring an efficiency of a performance Useful for statistical analysis Data for VAIC is derived from financial statements thus it is accurate	The VAIC cannot be exclusively attributed to intangible assets and 'noise' still exist within the numbers

As a general approach for IC evaluation I chose VAIC method. The opted method is the most appropriate/perfectly suits the methodology of my study for a number of reasons:

1. It is relatively simple in calculations

2. The data for calculations is derived from financial statements thus it is audited and therefore objective and verifiable
3. It is convenient for statistical analysis
4. It evaluates Human Capital and Organizational Capital separately from IC
5. VAIC metrics are useful for comparison and could be used as a metric for the measurement of performance efficiency

All these considerations make VAIC method an ideal measure in the context of my study.

Even though VAIC is a detailed and widely-used IC valuation method, it was subjected to criticism among scholars.

There are several important disadvantages when utilizing the VAIC model. First, it is founded on financial statements, which are signs of the past strategy. Second, VAIC does not take into account the synergies that exist among the different elements of VAIC. Third, the model does not provide a broad analysis of the innovation potential and Relational Capital of the firm. Another critical review of the VAIC measure was conducted by Ståhle et al. (2011), who highlighted a number of issues. First, the authors noted that the VAIC model measures only the operational efficiency of a company (in a different way) and that there is no real connection with IC. For example, in the case of HC, the model considers only annual salaries, neglecting their knowledge, skills, motivation, experience or training. It is similar to analyzing SC, while there is no RC in the model.

Another disadvantage of the model is its computation. In the case of HC, the higher the HC, the higher the HC. However, when calculating HCE (HCE = VA/HC), a lower value for HC means better HCE. This can be explained up to a level by stating that HCE is a relative measure and illustrates the intensity of HC operation.

Another disadvantage is the too far-reaching simplification of the measurement of human capital at labor costs, which leads to an underestimation of its value compared to other methods. It is also possible that the company is not exploiting its resources effectively, but it is masked by more efficient employment of other resources, which leads to similar levels of the overall VAIC score. The VAIC method cannot be applied to firms that disclose negative book value or negative profit, because in this case the cost is higher than their output, which leads to incorrect performance. VAIC approach was criticized by Chu et al. (2011) for its inability to measure IC in companies with negative book value or negative operating profit. They argue that the VAIC model does not produce valuable analysis in companies that have their input more than their output, and as a result, their performance is low. Stahle et al. (2011) demonstrates that the VAIC

is an invalid measure of the IC, arguing that the VAIC approach includes an unsettled concept of capitalization of the IC through its human and structural capital components.

Chu et al. (2011) also point to the feedback problem between HC and SC, which may cause difficulties in establishing the exact weight of each element in the calculation of the overall IC measure. Andreissen (2004) criticizes some methodological issues relating to the VAIC. Among other things, he does not agree with the interpretation of all costs associated with employees as assets (the value of human capital). The assets of the company are connected to the attainment of future benefits, and all items that will not work for future benefits should be reflected in the income statement. He mentions that some employee-related costs may be a source of future benefits (for example, training and development of employees), but most of these costs should be directly included in the income statement. He adds that even if we treat all employee-related expenses as assets, most of them should be immediately (in the same reporting period) amortized, since there is no reason to assume that they will benefit in future periods. Andriessen also disputes the validity of the calculation of intellectual capital as the residual value of two values: value added and human capital. This approach means that, for example, when the operating result is negative, the company's structural capital must also be negative, which is inconsistent and illogical.

The above-mentioned critics have initiated a discussion on whether the chosen method (VAIC) is suitable for IC measurement. However, at this point in time, there is no perfect method available for measuring the IC. These critics also suggest that future researchers should contemplate on the introducing of other control factors and performance determinants that can help in obtaining more specific and precise results. Despite the limitations inherent in VAIC as the IC measurement method discussed above, its simplicity, subjectivity, reliability and comparability make it an ideal indicator for the context of the present study as this study makes an original contribution to the existing IC literature by analyzing IC performance of various sub-sectors within the AFS. In addition, the fact that the UK Department of business, innovation and skills uses VAIC as an indicator of IC usage in firms contributes significantly to its validity (Zéghal and Maaloul, 2010).

Empirical evidence of the relationship between IC and corporate performance.

In the field of empirical research, many studies have empirically used VAIC as a measure of IC. Mavridis (2004) used VAIC to analyze the data of Japanese banks. He pointed out that Japanese banks that have the highest performance indicators are those which use their HC most effectively. On the other hand, he said that the use of financial assets was less important. An empirical study on the relationship between IC, market value and financial performance was also

conducted by Chen et al. (2005). They employed a sample of Taiwanese listed firms using Pulic's (2000) VAIC. Their work highlighted the significance of IC in increasing firm profitability and revenue increase. Shiu (2006) studied the correlation between VAIC and corporate performance of 80 Taiwan listed technologies firms. Results showed a significant positive correlation between VAIC and profitability (ROA) and market valuation (MB), as well as a negative correlation between VAIC and productivity (ATO). Tan et al. (2007) utilized the VAIC methodology to study data from 150 listed companies on the Singapore Stock Exchange, and conclude that:

- IC and firm performance are positively associated;
- IC correlates with future performance of a firm;
- the growth rate of a company's IC is positively related to the firm's performance.

Gan and Saleh (2008) studied the relationship between IC and firm performance of technology-intensive firms listed on Bursa (Malaysia), examining whether value creation efficiency (measured by VAIC), can be explained by market valuation, profitability, and productivity. General, the study of Gan and Saleh (2008) found that VAIC can explain profitability and productivity, but fails to explain market valuation. Bharathi Kamath, G. (2008) analyzed the top 25 firms in the drug and pharmaceutical industry in India. The results of the study showed that human capital was the one that was seen to have a significant effect on the profitability and productivity of companies during the period of study.

Bykova and Molodchik (2011) studied the relationship between VAIC and revenue growth rate of 115 companies within the Perm region. The study indicated positive relationship of HC and SC on firms' performance. In another Russian study, Tomchuk et al. (2013) pointed a positive relationship between parts of IC, namely HC and SC, and firm performance namely Return on sales of 15 Perm region firms.

Wang et al. (2014) during the study of the Chinese high technology firms found a positive and significant correlation between HC and firm performance. Morris (2015) examined the relationship between human capital efficiency and the financial and market performance of companies listed on the Main Board and Alternative Exchange (ALT-X) of the Johannesburg Stock Exchange. The results of the study confirmed that HCE enhances a company's financial performance. Dženopoljac et al. (2016) studied the degree to which IC and its key components affect the financial performance of selected ICT companies compared to effects on physical and financial capital. The results of the research suggested that, when using firm size and leverage as control variables, only capital-employed efficiency has significant effect on

financial performance. Andreeva and Garanina (2017) conducted an empirical research on the relationship between three main elements of IC and the performance of Russian manufacturing companies. They concluded that SC and HC have influence on a performance, while RC does not have such effect.

1.3. Performance indicators in retail industry

Retail industry overview.

Retail trade is a sector of the economy, which consists of individuals and companies engaged in the sale of finished products to end consumers. According to Philip Kotler, "Retailing includes all activities related to the sale of goods or services to end users for personal and non-commercial use." Companies within the retail industry must provide desirable products, while managing inventory and controlling costs, to succeed. Additional activities of retail might include advertising, data processing, inventory maintaining.

Retailing is the one of largest private sectors in the world and the prime movers of the economy. According to Statista, an online statistics, market research and business intelligence portal, the total value of the European retail trade in 2017 was roughly 3253 billion euros. Total retail sales in the United States in 2017, as said by the United States Census Bureau, were 5733 billion US dollars. Retail industry significantly contributes to the Gross Domestic Product of the US accounting for 5,9% of overall US GDP. The Top 250 Global Retailers revenue generated in 2017 was 4310 billion US dollars and 30.4% of the overall revenue was produced by the top 10 ranked companies (Deloitte, 2017). Retail industry is predominant in developed countries such as the US, Canada, UK etc. In addition, retailing industry is a major employer in most of the economies. The United States department of labor states that in 2016 the employment in the Retail sector in the US comprised of 15,820 thousands of jobs. Taking into account the economic and the financial figures of the retail it becomes evident that retailing has a remarkable impact on the economy of a country.

Types of Retailers.

Over the past two decades, retail has undergone dramatic changes. Some retail categories have disappeared while new ones have emerged. In some regions, the retail industry is dominated by small family-owned or regional stores, but this market is gradually occupied by international corporations such as Wal-Mart. Larger retailers have succeeded in the creation of large distribution chains, inventory management systems, financial pacts, and large-scale marketing plans.

Modern consumers are given a wide variety of options where, how and what to buy. Categories of retailers differ from each other in the size, quality, quantity, price, types of products etc. The following retailer types in accordance with retailing firms' differences might be derived:

- **Department stores.** This type of retailer is often the most complex offering a wide range of products and can appear as a collection of small retail stores run by one company. It vends product at various price levels and allows a costumer to purchase a wide variety of goods. Among the categories of Department stores there are clothes, cosmetics, jewelry and more.
- **Supermarkets and Grocery stores.** As a rule, the main attention of this type of retail trade is in the supply of all kinds of food and beverages. However, many retailers of this classification have diversified and now supply products for home and consumer electronics as well.
- **Warehouse Retailers.** This is a type of store that sells a limited stock in bulk at a discount rate. Warehouse stores are usually located in shopping or business parks, where the rent is lower.
- **Specialty Retailers.** Typically, this type of retailers specializes in a specific category of goods. Such stores sell only selected products of one brand and give priority to customer satisfaction.
- **Convenience Retailers.** The focus of such retailers is gasoline and a limited range of food products and car care products at a premium "convenience" price.
- **Discount Retailers.** This type of retailers focuses on selling various products at a discount. Such firms offer low prices for less fashionable branded products from a number of suppliers.
- **E-tailer.** Retailers in this category offer their products through Internet sites and deliver products directly to customers at home or workplace. Such retailers are very convenient and are able to provide a wider geographical customer base.

Considering the division of retail by the types of products, two main categories might be identified:

- **Hard** - These types of goods include appliances, electronics, furniture, sporting goods, etc.
- **Soft** - This category includes clothing, apparel, and other fabrics.

According to the U.S. Census Bureau, the 13 major types of retailing businesses, along with the percentage of total sales each generates annually in the U.S. retail industry are:

- *20.0%* - Motor vehicle & parts dealers
- *13.0%* - Food & beverage stores
- *12.5%* - General merchandise stores (hypermarkets, department stores, discount stores, warehouse clubs)
- *11.0%* - Food services & drinking places
- *10.0%* - Gasoline stations (and convenience stores)
- *9.2%* - Non-store retailers (Internet shopping, catalog, direct sales, etc.)
- *6.0%* - Building material & garden dealers (home improvement)
- *6.0%* - Health & personal care stores (pharmacy/drug stores)
- *5.0%* - Clothing & clothing accessories stores
- *2.3%* - Miscellaneous store retailers (specialty retailers)
- *2.0%* - Furniture stores
- *2.0%* - Electronics & appliance stores
- *1.7%* - Sporting goods, hobby, book & music stores

Retail Trends.

Online and omnichannel stores

Since Amazon began selling books online in 1995, retailers - and many other commentators-have been asking what role, if any, physical stores can play in the retail arena. Some have gone so far as to predict the ultimate demise of stores, while others state the merits of various hybrid omnichannel solutions (Hodson, 2017). The following table represents the shopping preferences of retail customers in the US by product category in 2017:

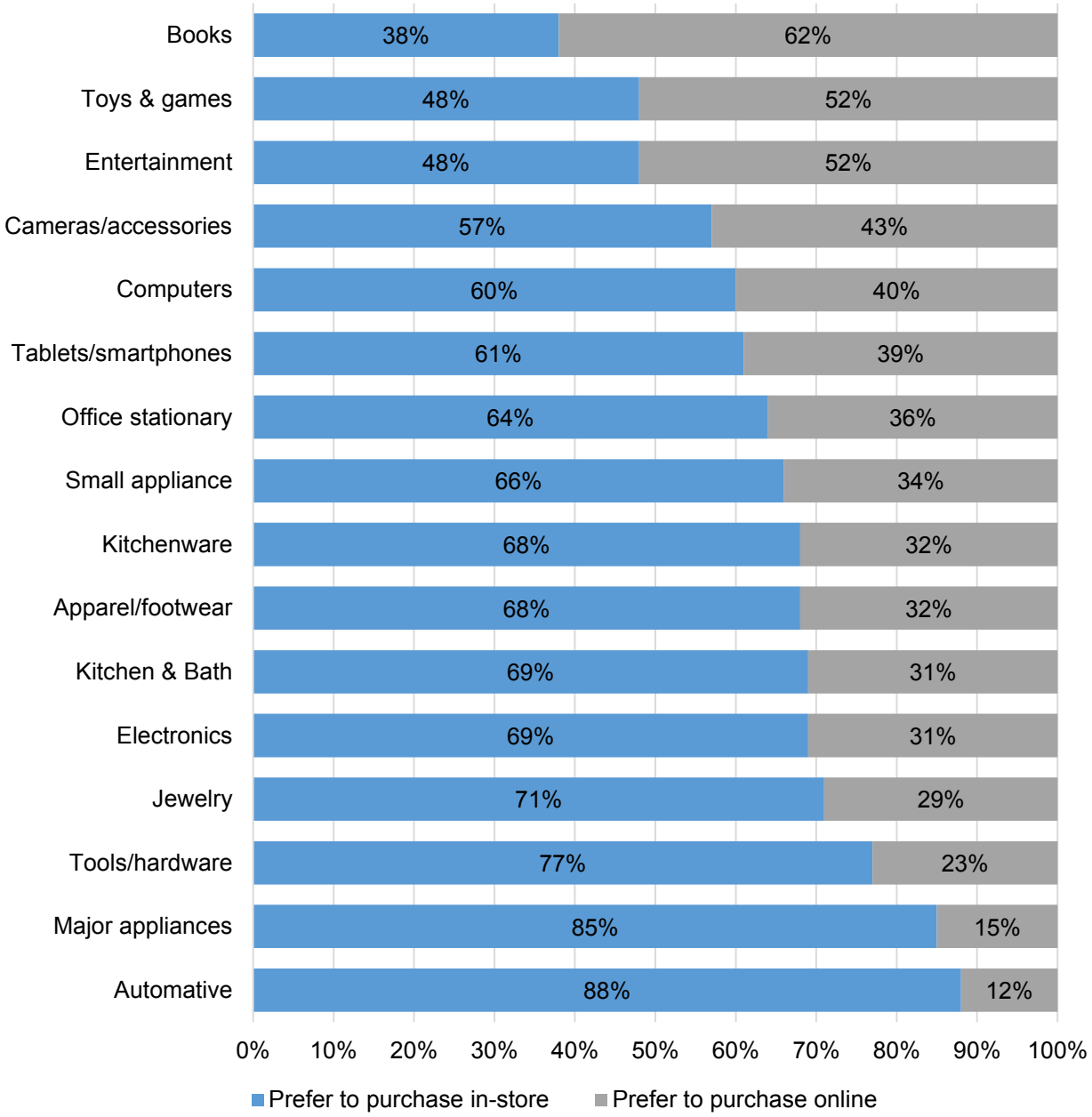

Figure 2 Online vs. in-store shopping preferences of consumers in the United States as of 2017, by product category [*]

Of course, the trends are not very good for retail stores, which tend to complain about difficult conditions and economical consumers. While retail sales are generally quite high, over the past few years, most of the inflation-adjusted income of retailers has been driven by online channels. Meanwhile, traditional retailers face flat or declining sales and large, expensive store networks (Hodson, 2017).

[*] Source: Statista, market research and business intelligence portal

According to Hodson (2017) existing retailers use omnichannel concepts that aim to offer consumers a seamless experience, whether they buy products online or in the store. The best of these offerings work well: consumers get the convenience of shopping on a computer, smartphone, or tablet, or in person, and retailers can reduce marginal maintenance costs, such as by encouraging consumers to pick up bulky items in the store rather than having them shipped to their home.

With the exception of the long-term trend towards the destruction of the retail business in the transition from physical spaces based on shops to fully online stores or omnichannel concepts, there are other later trends. Among such trends in 2017-2018, I highlighted the trends related to the analysis of big data, changes in the situation with the employment of retailers, such as an increase in the closure of stores and retail robotics, shifts in the organizational structure of retailers.

Big Data analysis

In the current state of retail industry, data becomes the basis. Top retail performers focus on data almost half of those who "left behind".

In accordance with “Top 5 Retail use cases” ebook by Hitchcock (2018):

“New data sources, from log files and transaction information to sensor data and social media metrics, are opening new opportunities for retail organizations to achieve record value and competitive advantage in an enlarging industry space. From a business viewpoint, retailers will need to offer people across the organization the ability to execute decisions quickly, precisely and confidently. The only way to do this is to use big data to make better plans and decisions, to better understand customers, to identify hidden trends that open up new opportunities, and more.

The following cases represents the use of Big Data analytics in retail:

1. Customer Behavior Analytics for Retail
2. Personalizing the In-Store Experience with Big Data
3. Increasing conversion rates through predictive analytics and targeted promotions
4. Customer Journey Analytics
5. Operational Analytics and Supply Chain Analysis

Data development that drives action can quickly combine and explore massive sets of structured and unstructured data to reveal hidden patterns, new correlations, trends, customer insights, and other useful business information.”

The impact of these tools on business is real. According to a recent study conducted by Shockley and Mercier (2017):

"Sixty-two percent of retailers report that the use of information (including big data) and analytics creates a competitive advantage for their organizations, compared to 63 percent of cross-industry respondents. We also found that retailers use a business-oriented and pragmatic approach to big data. The most effective big data strategies first define business requirements and then adapt infrastructure, data sources, and analytics to support business opportunities."

For retailers to maintain a competitive advantage in an accelerating market, it is increasingly important that they seek proactive ways to use new and extensive data sources in innovative ways. Through data development platforms, retailers can gain a deeper understanding of their customer data, which in turn will lead to valuable business data.

Employment

Store Closures will accelerate. According to Peterson (2018), some big Retailers such as Toys R US, JCPenney, Payless and a long list of others are in trouble. The retail disaster is not an isolated event, but an acceleration of what is called "online shopping" and a change in consumer preferences for discounted purchases and away from outdated brands.

Retail, as is known, is changing, and not because of the debt-laden U.S. Retail sector. With voice-activated purchases expected to have a big year in 2018, with the way we order restaurant food as well as the AR view product show, physical retail infrastructure can continue to see serious decrease.

Robotic Retail will scale. According to Thomasson (2018), the ratio of the robot to the human is changing rapidly in e-Commerce warehouses. Many of the new jobs are in these environments. Walmart is testing retail robots to scan the shelves and cleaning. JD.com has invested in retail e-Commerce warehouse automation. Drone delivery is increasingly becoming an option.

To assume that the surge of robots of the 2020s will not affect retail is illogical. Self-driving cars themselves could theoretically "take" packages with a robotic resident in a self-propelled car. Until 2020, we will see more and more robots facing consumers in the retail store. Then we have retail mini-stores without a cashier and QR code; sometimes they appear as mobile stores that move, and other times more like a Japanese vending machine that works with artificial intelligence. All of this combined and heading to the traveling "airships" where drones go down to deliver our goods - so, robotic retail trade is just beginning; but by the 2030s will be the norm.

Improvements in logistics, robotics and customer satisfaction, such as Amazon Dash buttons, mean that big retail growth is happening not only around data-centric retailers, but also around robotic retailers that are entering the era of automation in the retail sector.

Organizational structure

A clear focus on operational excellence combined with consumer appetite and comfort level for technology adoption should probably dominate retailers ' investments in the company's infrastructure (Deloitte, 2017). Unique store experience, Retail and various digital tools are the main trends that change the infrastructure and processes of retail firms.

Unique in-store experiences. As stated by Lauren Thomas (2017), retailers cannot just offer amazing products, digital optimization and some kind of personalization — they need to shop as human and visual as possible. The market may be changing, but the people are still the same as they traded in the market hundreds and thousands of years ago. Individuals are still impressed with the same things; great customer service, visual design, easy layouts, comfortable experiences that are memorable.

Offline experience is the “analog tech” that create retention and increase the credibility of the brand. Many of these" offline experiences " will also touch on how data and AI are used to collect and reorient customers in new ways. What is an experience in the digital age? It’s a cluster of how a brand reaches you; and data-driven approaches that are immersive is the key. But these can also occur in-person, and retailers are learning how in 2018 (Lauren Thomas, 2017).

Retailtainment. Creating more immersion in the store is also on the rise as physical retailers understand what they need to have their customer experience of the game in order to stay relevant. This takes many forms, but adding value-add educational and entertainment to store environments is a big plus. From storefronts in the style of the showroom to the online stores which have physical footprint of the brand, omnichannel is taking new forms, motivating way to purchase from click and collect to new levels showrooming (Sopadjieva et al., 2017). Retail brands are no longer just products, they are live experiences. As such, retailtainment and new experiments are on the rise, turn to shopper driven experience and changing consumer preferences.

Digital tools. Mobile technologies have changed the way consumers interact with brands, and therefore retailers have had to invest in digital and omnichannel capabilities to respond to changing consumer behavior. However, one area that lags behind this digital transformation is the management of store associates, which in many cases are still associated with the use of legacy systems and infrastructure. Nowadays, more and more retailers moving towards empowering their store partners with mobile solutions (PWC, 2017).

Integrated mobile platforms in the hands of store partners are essential for a true omnichannel customer experience. In addition to personalized services, these mobile

technologies integrate hassle-free payments on-site, eliminating lengthy checkout and waiting times from purchases.

Performance Indicators in retail.

Retail industry is one of the most competitive industries in the world, focusing on increasing sales and retaining more customers. In order to stay on top each retail company should keep track of its performance. A following number of retail performance indicators when properly monitored serves as sources of competitive advantage, assisting in the delivery of superior performance:

- **Sales per square foot.** This indicator is a good measure of how effective the company is using retail space and assets. Sales per square foot (or square meter) is the average store revenue for each foot of retail space. To calculate this figure, sales must be divided by the total square feet of store space. This can help to define which store locations are the most profitable.
- **Sales and Gross Margin.** It is one of the most important performance indicators in retail, and it indicates the volume of sales over a period of time. Sales can be compared by location, retail stores, product categories, etc. to detect performance trends and prepare marketing strategies and offers. Gross margin is the gross profit in a percentage of sales. Gross profit is vital for determining the percentage mark-up for products. To calculate gross profit, a firm must divide the difference between total sales revenue and the cost of goods sold by total sales revenue.
- **Return on Investment.** It is an important performance metric in Retail industry. It measures the profit or loss from an investment relative to the amount of money invested. It is computed by dividing the difference between firm's gain from investment and cost of investment by cost of investment.
- **Sales per Employee**. While fixed asset turnover ratio is a measure of a company's use of its fixed assets as a means of generating sales, sales per employee analyzes business benefit at the level of individual staff. This does not mean that this ratio should be used (or used) as a way to determine the performance of individual employees. Rather, it still reflects the larger decisions of the company's management. However, it is calculated by breaking down the sales or income that the company earns compared to the number of employees working in the company. The formula for this ratio is sales / revenue per employee = revenue / number of employees (average)

- **Gross Margin Return on Investment.** GMROI shows the amount of money the firm has received back (i.e. ROI) for every dollar spent on inventory. Formula for figuring out GMROI: gross profit / average inventory value. GMROI can give a clear idea of how a store is doing overall. It can also tell how well specific products or departments are performing, so managers can get an idea of how to optimize inventory and merchandising.
- **Inventory Turnover Rate.** Stock turnover refers to the number of average stocks of the product per year. This is an indicator of how quickly a firm could sell an inventory. To calculate this indicator, the COGS must be divided by the average inventory for the same period.
- **Return on Revenues.** It tells how much net income is made from revenues. Almost as important is the gross margin return on investment, which is the gross profit on the value of company's inventory. The more a retailer make per unit sold, the easier it is to produce bottom line net profit.
- **Return on Total Assets.** Return on total assets shows a company how much operating profit it's making from its assets. Here again, the more the better. In the retail industry, this number will vary depending on the business. Specialty retailers require less retail space, fixtures, inventory and more. On the other hand, home improvement stores operate in much larger retail footprints and therefore require larger assets. The need to use more doesn't necessarily make these stores worse. It's just the cost of doing business in a particular industry. What is important is how the retailer's return on total assets is compared to competition.
- **Return on Capital Employed.** It indicates how effectively retailers use their capital. It is defined as earnings before interest and tax (EBIT) divided by the capital employed, which is usually represented by total assets less current liabilities. However, a more appropriate definition of capital used would be shareholders' equity plus net debt.

Among these indicators, Gross Margin, Return on Investments and Sales per Employee were chosen since they represent both financial and operational performance of Retail firms, they might be correlated to the components of IC, they could be calculated for the majority of retail firms and thus be employed for an econometric analysis.

1.4. Literature overview and hypotheses proposition

As a result of the first part of the literature review, IC and all its components, namely

Human capital, Relational capital and Structural capital were defined and studied. In the next part, the main IC valuation methodologies such as Direct Intellectual Capital methods (DIC), Scorecard methods (SC), Market Capitalization Methods (MCM) and Return on Assets methods (ROA) were examined. Within these four classifications two most applicable due to the context of the empirical study, were selected and the models which are related to the chosen classifications were assessed. The evaluation and the comparison of the opted models displayed the VAIC coefficient as the most precise and efficient for an empirical investigation according to the context of our study.

During the examination of VAIC model, a comprehensive overview of all steps within the VAIC calculation was performed. Moreover, criticism and limitations of VAIC method were discussed and explained. At the end of the VAIC examination, the studies on empirical investigation of the relationship between VAIC and firm performance were overviewed.

Through the review of studies in which the main focus lay within the investigation of influence of IC on firm performance, a relationship among various IC components and physical capital and firm performance within various industries was identified. Some scholars identified a significant influence of HCE on performance indicators (Mavridis, 2004; Bykova and Molodchik, 2011; Tomchuk et al., 2013; Wang et al., 2014; Morris, 2015; Andreeva and Garanina, 2017), others proved substantial correlation between SCE and performance of a firm (Bykova and Molodchik, 2011; Tomchuk et al., 2013; Andreeva and Garanina, 2017). In addition, some scholars indicated relationship between CEE and performance (Dženopoljac et al., 2016). Also, some studies identified relationship between ICE and firm performance (Chen et al., 2005; Shiu, 2006; Tan et al., 2007; Gan and Saleh, 2008). During the hypotheses formulation, the results of the examined studies were taken into account.

In the next part of the literature review, the brief overview of the retail industry was presented. The classification of retail firms by types of products and activities was performed. In addition, the latest trends in retail industry were examined. In the last part of the paragraph devoted to retailing, the main performance indicators were discussed and three of them were chosen as measures of frim performance for an econometric study. The indicators which were selected for quantitative analysis include Gross Margin, Return on Investments, Sales per Employee.

The goal of the thesis was specified as: to identify the nature of relationship among the IC and its components and company's performance indicators such as Gross Margin, Return on Investments, Sales per Employee. In accordance with the goal of a research and the studied articles, five logical and distinctive hypotheses were developed and tested. The hypotheses

addressed the vital issue of establishing and explaining the relationship between IC efficiency and performance indicators of firms within US Retail industry. I hypothesize that VAIC components, namely HCE, SCE, CEE, and ICE operating together or separately have direct positive impact on performance of companies within retail industry. The research hypotheses are formulated as follows:

Hypothesis H1. HCE has a direct positive relationship with performance of enterprises in the Retail industry.

H1a. Enterprises that have greater HCE are more likely to have higher Sales & Gross Margin

H1b. Enterprises that have greater HCE are more likely to have higher ROI

H1c. Enterprises that have greater HCE are more likely to have higher Sales per Employee

Hypothesis H2. SCE has a direct positive relationship with performance of enterprises in the Retail industry

H2a. Enterprises that have greater SCE are more likely to have higher Sales & Gross Margin

H2b. Enterprises that have greater SCE are more likely to have higher ROI

H2c. Enterprises that have greater SCE are more likely to have higher Sales per Employee

Hypothesis H3. CEE has a direct positive relationship with performance of enterprises in Retail industry.

H3a. Enterprises that have greater CEE are more likely to have higher Sales & Gross Margin

H3b. Enterprises that have greater CEE are more likely to have higher ROI

H3c. Enterprises that have greater CEE are more likely to have higher Sales per Employee

Hypothesis H4. ICE has a direct positive relationship with performance of enterprises in Retail industry.

H4a. ICE positively influence Sales & Gross Margin

H4b. ICE positively influence ROI

H4c. ICE positively influence Sales per Employee

Hypothesis H5. HCE, SCE and CEE have a direct positive relationship with performance of enterprises in Retail industry.

H5a. HCE, SCE and CEE positively influence Sales & Gross Margin

H5b. HCE, SCE and CEE positively influence ROI

H5c. HCE, SCE and CEE positively influence Sales per Employee

CHAPTER 2. EMPIRICAL RESEARCH

2.1. Methodology

The main focus of the research is to address the problem of an unavailability of empirically supported data about the nature and the type of influence of IC on firms' performance in retail industry. The solution of this problem might be useful for the managers within the retailing since the labor force and the organizational capital are one of the main sources of efficient performance and competitive advantage of a firm. The specified problem might be addressed with the appropriate research goal, which in our case is the identification of the nature of the relationship among the components of IC and company's performance indicators. Methodology of the study corresponds with the identified goal and include the following parts:

1. Calculation of company's IC with the VAIC methodology. The complete step-by-step process of VAIC calculation is described in the paragraph 1.2.
2. Estimation of the selected KPI's of retailing firms, namely Gross Margin, Return on Investment, Sales per Employee. The formulas for computation of these indicators are presented in the paragraph 1.3.
3. Statistical analysis of the selected variables:
    a. Descriptive statistics of selected variables
    b. Regression analysis of the proposed econometric models

At first, the list of world largest US retailers was formed and the VAIC computation for each company was performed. The specifications of retailers' selection, the specialties of firms, and limitations will be discussed the following paragraph.

Secondly, with the purpose of testing the hypotheses which were stated in the paragraph 1.4., a number of econometric models were formulated.

Thirdly, all the dependent and independent variables are introduced and the brief descriptions of these variables are given. In addition, control variables are selected and specified with the purpose of the more correct estimation of the effect of VAIC components on the dependent variables.

Fourthly, the descriptive statistics of the studied variables is presented and the summary of the examined sample is given.

Lastly, the regression analysis is conducted and the description of the results is given. The regression analysis is divided into two parts. Within the first part, several multiple linear

regressions are conducted, testing models within individual elements of VAIC. After that, last two hypotheses are tested with the models which include ICE and all three components of VAIC at once. Thereafter, the interpretation of the results of the analysis and potential managerial application are given.

Overall, the type of the current research is quantitative: the obtained results are taken by the examination and the study of the financial data and the construction of a regression analysis. The research design of the study is explanatory since empirical part intends to establish casual links among regressors and dependent variables.

The nature of the studied data is pooled panel which include characteristics of both cross-sectional and time series datasets. For the analysis, Ordinary Least Squares (OLS) regressors are utilized. In accordance with the main objective of the study, which was stated in the introduction, and with the formulated hypothesis the following panel regression models were composed:

Model 1: $Y_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

1a. $grossmargin_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

1b. $ROI_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

1c. $SPE_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

Model 2: $Y_{i,t} = \beta_0 + \beta_1 * SCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

2a. $grossmargin_{i,t} = \beta_0 + \beta_1 * SCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

2b. $ROI_{i,t} = \beta_0 + \beta_1 * SCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

2c. $SPE_{i,t} = \beta_0 + \beta_1 * SCE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

Model 3: $Y_{i,t} = \beta_0 + \beta_1 * CEE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

3a. $grossmargin_{i,t} = \beta_0 + \beta_1 * CEE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

3b. $ROI_{i,t} = \beta_0 + \beta_1 * CEE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

3c. $SPE_{i,t} = \beta_0 + \beta_1 * CEE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

Model 4: $Y_{i,t} = \beta_0 + \beta_1 * ICE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

4a. $grossmargin_{i,t} = \beta_0 + \beta_1 * ICE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

4b. $ROI_{i,t} = \beta_0 + \beta_1 * ICE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

4c. $SPE_{i,t} = \beta_0 + \beta_1 * ICE_{i,t} + \beta_2 * leverage_{i,t} + \beta_3 * MC_{i,t} + \varepsilon_{i,t}$

Model 5: $Y_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * SCE_{i,t} + \beta_3 * CEE_{i,t} + \beta_4 * leverage_{i,t} + \beta_5 * MC_{i,t} + \varepsilon_{i,t}$

4a. $grossmargin_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * SCE_{i,t} + \beta_3 * CEE_{i,t} + \beta_4 * leverage_{i,t} + \beta_5 * MC_{i,t} + \varepsilon_{i,t}$

4b. $ROI_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * SCE_{i,t} + \beta_3 * CEE_{i,t} + \beta_4 * leverage_{i,t} + \beta_5 * MC_{i,t} + \varepsilon_{i,t}$

4c. $SPE_{i,t} = \beta_0 + \beta_1 * HCE_{i,t} + \beta_2 * SCE_{i,t} + \beta_3 * CEE_{i,t} + \beta_4 * leverage_{i,t} + \beta_5 * MC_{i,t} + \varepsilon_{i,t}$

2.2. Variables

In this section, the descriptions of variables of panel regression models are given. All financial data was obtained from Thomson Reuters Datastream database and Annual Reports of selected companies.

Dependent variables:

In order to conduct regression analysis, three dependent variables were chosen as one of the major performance measures within the retail industry:

- *Gross Margin*: a financial measure that is used to assess the financial condition of firms and the business model by determining the proportion of money left over from income after accounting for the value of goods sold.
- *ROI*: financial ratio, which shows the level of profitability or loss of a firm, taking into account the amount of investment in the firm.
- *Sales per Employee:* a metric that helps to identify how efficiently a company employs its workforce to generate revenue.

Independent variables:

The VAIC approach, which is fully described in paragraph 1.2., delivers a concept for generating independent variables which compose two of the components of IC - human and structural capital, and a separate from the definition of IC - financial capital measure. The chosen explanatory variables are the following:

- *HCE*: a measure of the effectiveness of human capital within a firm or, in other words, it indicates how much value added has been created by the investments in employees (Pulic, 2000).
- *SCE*: a measure of the efficiency of structural capital, which include organizational, process and innovational capital.
- *CEE*: an indicator that shows how much value was created through the efficient use of physical and financial capital of a company.

Control variables:

The selection of control variables is justified by the inclusion of those variables which had been widely used by researchers in the studies linking components of IC and company performance (Firer and Williams, 2003; Abidin et al., 2009; Clarke et al., 2011; Vishnu and Gupta, 2014; Dženopoljac et al., 2016), namely size of a firm and leverage. Most of the scholars utilized the industry control variable, but for the present study this variable is irrelevant since all companies pertain to the same industry. The brief descriptions of variables are the following:

- *Leverage*: A high proportion of debt may result in the firm primarily focusing on the needs of debt holders (Williams, 2000). This is not in line with the stakeholder opinion implied by VA and VAIC. Alternatively, firms that rely heavily on debt may not have the security necessary to attract investors and are likely to have higher interest payments reflecting the firm's risk and profitability.
- *Size of the firm (LCAP)*: Size of the firm as calculated by the natural log of total market capitalization (Firer and Stainbank, 2003; Firer and Williams, 2003) is used to control for the impact of size on wealth creation through economies of scale, monopoly and bargaining power (Chandler, 1990; Porter, 1980; Riahi-Belkaoui, 2003).

The summary of all variables which are named according to their names in the regression analysis are presented in the table below:

Table 3

Summary of variables

Variable	Description	Formula

Dependent variables		
$grossmargin$	Gross margin refers to gross profits expressed as a percentage of sales. This is an important indicator of a company's financial performance. Gross margin is also important for determining the markup percentage for products.	(Revenue - COGS) / Revenue
ROI	Return on Investment (ROI) is a performance measure, used to evaluate the efficiency of an investment or compare the efficiency of a number of different investments. ROI measures the amount of return on an investment, relative to the investment's cost.	(Gain from Investment - Cost of Investment) / Cost of Investment
SPE	The sales per employee ratio is an asset utilization measure that permits analysts to understand how effectively a company utilizes its staff to produce profit	Revenue / Number of Employees
Independent variables		
HCE	HCE describes how much a company creates through one monetary unit invested in its human resources	VA/HC
SCE	With SCE, information can be obtained about how much capital a company can create through structural capital (SC)	SC/VA
CEE	CEE defines how much value is created in one monetary unit invested in financial or physical capital.	VA/CA
Control variables (independent variables)		
$leverage$	Leverage is the amount of debt used to finance assets.	Total debt/Total assets
MC	Market capitalization is the aggregate valuation of a company based on its current share price and the total number of outstanding shares. In the study, the MC is the size of a firm and it is computed as a natural log of total market capitalization	Ln (Market Capitalization)

2.3. Sample selection

The main focus of the empirical research is the largest US retailing companies in terms of financial performance and operations. The primary justification of this choice is availability of the necessary data for VAIC computation as well as for the estimation of the selected performance indicators within the companies. In addition, the US has the greatest number of public retailing companies. As for the Russian retailers, there are several major companies

operating on the Russian market, but due to the lack of required information and thus inability to calculate studied measures, they are not included in the final sample.

The final list of firms comprises the 33 largest publicly traded United States companies, operating in the Retail industry for the period from 2012 to 2016 year (total 5 years). The full list of companies is provided in the Appendix 1. The studied companies were taken from the "Global Powers of Retailing" report by Deloitte (2017) and all the necessary data was obtained from the annual reports of companies as well as from Thomson Eikon Datasrteam database. The sample was selected according to the Deloitte methodology, which include companies basing on their non-auto retail revenue for FY2015 (encompassing companies' fiscal years ended through June 2016). To be included on the list, a company does not have to derive the majority of its revenue from retailing so long as its retailing activity is large enough to qualify. Private equity and other investment firms are not considered as retail entities in this report - only their individual operating companies.

The following limitations were faced throughout the data collection:

1) The negative operating profit. If a company reported negative operating profit it causes concerns for the calculation of Value Added coefficient and thus for the estimation of all components within the VAIC measure. Therefore, all retailers which generated negative operating profit were excluded from the final sample.
2) The lack of data, especially it concerns such parameters as the Employee Costs, an indicator which is vital for the calculation of VA and HCE within the VAIC metric, and the total number of employees. The lastly mentioned indicator is the basic parameter for the estimation of the Sales per Employee KPI.
3) The type of a retailer. With the purpose of avoiding a biasedness of the regression results and thus conduct more accurate analysis and conclusions several US retailers were excluded from the list. Examples of such companies are the ones that do not derive the major portion of the revenue from retail operations. Such companies are: CVS Health Corp., Apple Inc., Associated British Foods, Nike Inc., SHV Holdings, McKesson Corp., Berkshire Hathaway, and Tokyu Corp.
4) Amazon.com, Inc. This company is the largest US e-commerce retailer accounting for 43.5% of all e-commerce sales in the country in 2017 (CNBC). The inclusion of this company would result in biased estimators. The primary cause is the peculiarities of company's operations, relatively low number of employees and relatively high innovation capabilities, comparing to offline retail firms.
5) Privately held companies.

The sample could be subdivided into main groups: General Retailers and Food and Drug retail companies. The following figures represent the share of retailers within each of two groups justified by the specialization. Food and Drug retailers, overall 6 companies:

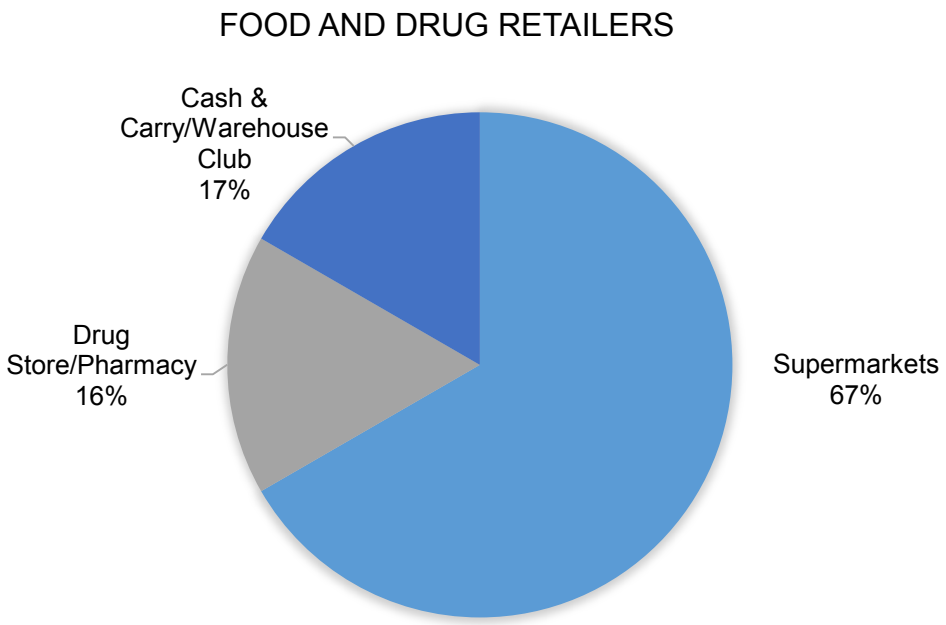

Figure 3 Food and drug retailers' distribution by specification[*]

And the General Retailers, consisting of 27 companies:

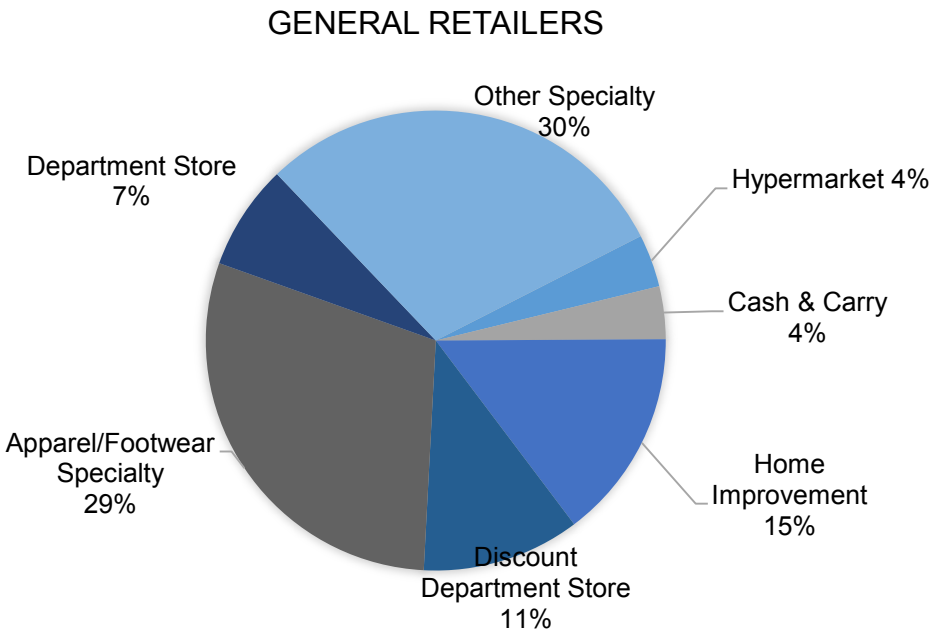

Figure 4. General retailers' distribution by specification

[*] Source: made by the author

2.4. Descriptive statistics of variables

This paragraph is devoted to a summarization and to a justification of the examined sample and measures of the data.

In the following table, the values of minimum, maximum, standard deviation and mean are presented for each of variables employed in the research (Table 4).

Table 4

Descriptive statistics

Variable	Mean	Standard deviation	Minimum value	Maximum value
$grossmargin$	0.370	0.118	0.133	0.674
ROI	0.655	0.37	0.154	2.071
SPE	212.206	110.743	73	578
HCE	10.08	5.604	2.773	34.48
SCE	0.871	0.068	0.639	0.971
ICE	10.951	5,672	3.412	35.451
CEE	0.402	0.246	0.092	1.645
$leverage$	0.226	0.183	0	0.744
MC	16.335	1.296	12.945	19.44

Most of the variables in the table is normally distributed which means that the selected companies are relatively similar, the only measure with high standard deviation is Sales per Employee. Extreme values of SPE might signal that some companies had issues with generating sufficient sales by their stuff, moreover, this assumption might be supported by the close values of firms' sizes and other profitability measures, gross margin and ROI.

The most balanced metric among components of VAIC is SCE and the most sensible is HCE. This data tells us that the studied companies are close in the efficiency of employment of their structural capital, but the opposite situation concern the efficient utilization of firms' workforce, which varies considerably.

As it is evident from the table that all of the studied variables have positive signs and only measure equals to zero is leverage. The zero value of firms leverage tells us that some firms do not use debt to finance its assets.

2.5. Econometric analysis

In this paragraph, the regression analysis was conducted with the purpose of determining the type of impact which VAIC has on the performance of retail companies. In order to test the stated hypothesis, at first, multiple linear regressions would be utilized with the intention to study components of VAIC individually. Afterwards, the model with an ICE component and models which include all three components of VAIC are analyzed and the type and significance of impact of these components when operating altogether are examined.

For the case of individual impact, regression analysis indicated that the overall choice of variable is acceptable. The individual effects of HCE on firm performance are presented in the table:

Table 5

Regression results: HCE and performance indicators

Variable	**Model (I)**	**Model (II)**	**Model (III)**
	$grossmargin_{i,t}$	$ROI_{i,t}$	$SPE_{i,t}$
$HCE_{i,t}$	0.006***	0.014**	0.163***
$leverage_{i,t}$	0.846	0.677	0.212
$MC_{i,t}$	0.219	0.205	0.029*
$Constant$	0.012***	0.009**	0.047
$Obs.$	165	165	165
$adj\ R^2$	0.059	0.032	0.144
$p\text{-}value$	0.005	0.033	0.000

Note: symbols *, **, and *** represent significance at $\alpha = 10\%$, $\alpha = 5\%$, and $\alpha = 1\%$ respectively

All three models are statistically significant at 1%, 5%, and 1% respectively. The interpretation of coefficients is as follows:

- HCE is significantly and positively related to all of the examined performance indicators, namely gross margin, ROI, and SPE.
- Adjusted R^2 equals to 0.059, 0.032 and 0.14 i.e. the models are able to explain 6%, 3% and 14% of the variance in the dependent variable.

The next independent variable is represented by the SCE and the regression results for models employing this variable are presented in the table 6:

Table 6

Regression results: SCE and performance indicators

Variable	**Model (I)**	**Model (II)**	**Model (III)**
	$grossmargin_{i,t}$	$ROI_{i,t}$	$SPE_{i,t}$
$SCE_{i,t}$	0.544***	1.23**	0.83***

$leverage_{i,t}$	0.843	0.879	0.536
$MC_{i,t}$	0.277	0.251	0.038*
$Constant$	0.896	0.988	0.000***
$Obs.$	165	165	165
$adj\ R^2$	0.088	0.042	0.247
$p\text{-}value$	0.005	0.041	0.000

Note: symbols *, **, and *** represent significance at $\alpha = 10\%$, $\alpha = 5\%$, and $\alpha = 1\%$ respectively

All three models are statistically significant at 1%, 5%, and 1% respectively. The interpretation of coefficients is as follows:

- SCE is significantly and positively related to all of the examined performance indicators, namely gross margin, ROI, and SPE.
- Adjusted R^2 is 0.088, 0.042, and 0.24 i.e. the models are able to explain 9%, 4% and 24% of the variance in the dependent variable.

The third independent variable is CEE and the regression results for models employing this variable are shown in the table 7:

Table 7

Regression results: CEE and performance indicators

Variable	**Model (I)**	**Model (II)**	**Model (III)**
	$grossmargin_{i,t}$	$ROI_{i,t}$	$SPE_{i,t}$
$CEE_{i,t}$	0.066	0.123	0.98***
$leverage_{i,t}$	0.5906	0.591	0.058
$MC_{i,t}$	0.1305	0.131	0.002**
$Constant$	0.000***	0.000***	0.62
$Obs.$	165	165	165
$adj\ R^2$	0.000	-0.003	0.11
$p\text{-}value$	0.266	0.486	0.000

Note: symbols *, **, and *** represent significance at $\alpha = 10\%$, $\alpha = 5\%$, and $\alpha = 1\%$ respectively

Only Model III showed significant results while Model I and II appeared insignificant. The interpretation of coefficients is as follows:

- CEE is significant at 1% level and is positively related to the SPE.
- Adjusted R^2 for CEE within the Model III is 0.11; i.e. the model is able to explain 11% of the variance in the dependent variable.

Despite only two models in which CEE showed no correlation to Gross margin and ROI all other models demonstrated high correlation with dependent variables. HCE and SCE were significant in all analyzed cases.

All of the models were tested for the appropriate specification by the Hausman, Lagrange Multiplier and Wald tests, where:

- Hausman test to choose between fixed effects (FE) and random effects (RE) model
- Lagrange Multiplier Test - (Breusch-Pagan) to determine whether random effects or pooled regression is adequate
- Wald test to choose between pooled regression and fixed effects regression

The resulted specification in accordance with the test results is pooled regression for all of the models.

In the following part of the analysis ICE component and performance indicators were examined. ICE represents the efficiency of Intellectual Capital and it include both coefficients, HCE and SCE. Individual effects of ICE on the gross margin, ROI and SPE are presented in the table:

Table 8

Regression results: ICE and performance indicators

Variable	**Model (I)**	**Model (II)**	**Model (III)**
	$grossmargin_{i,t}$	$ROI_{i,t}$	$SPE_{i,t}$
$ICE_{i,t}$	0.005**	0.014*	1.725***
$leverage_{i,t}$	0.013	0.067	0.338
$MC_{i,t}$	0.009	0.03	0.293**
$Constant$	0.463***	0.957*	0.62
$Obs.$	165	165	165
$adj\ R^2$	0.055	0.029	0.18
$p\text{-}value$	0.011	0.067	0.000

Note: symbols *, **, and *** represent significance at $\alpha = 10\%$, $\alpha = 5\%$, and $\alpha = 1\%$ respectively

As can be seen from the table, Models I and III are significant, while the Model II appeared insignificant with a p-value equals to 0.067. The interpretation of coefficients within the studied Models is as follows:

- ICE is significantly and positively related to gross margin and SPE, showing 5% and 1% level of significance respectively.
- Adjusted R^2 is 0.055, 0.029, and 0.18 i.e. the models are able to explain 6%, 3% and 18% of the variance in the dependent variable.

Here also all three models were tested for the appropriate specification and the resulted specification in accordance with the test results is pooled regression for all of the models. It might indicate that ICE and control variables are not correlated with each other.

The third part of econometric analysis consists of three models which considers VAIC components altogether. The regression results for HCE, SCE and CEE are presented in the table 9:

Table 9

Regression results: VAIC (HCE, SCE, and CEE) and performance indicators

Variable	Model (I)	Model (II)	Model (III)
	$grossmargin_{i,t}$	$ROI_{i,t}$	$SPE_{i,t}$
$HCE_{i,t}$	0.000	0.000	2.221
$SCE_{i,t}$	0.036	0.141	0.114***
$CEE_{i,t}$	0.098***	0.295***	0.079**
$leverage_{i,t}$	0.781	0.825	0.347
$MC_{i,t}$	0.597	0.386	0.005**
$Constant$			0.000***
R^2	0.26	0.163	0.297
$p\text{-}value$	0.000	0.000	0.000

Note: symbols *, **, and *** represent significance at $\alpha = 10\%$, $\alpha = 5\%$, and $\alpha = 1\%$ respectively

It can be seen from the table that all three models are statistically significant thus we could progress with further explanations. The regression analysis indicated the statistically significant relation between gross margin and Capital Employed Efficiency from the model (I), whereas Human Capital Efficiency and Structural Capital Efficiency showed no correlation to the selected performance indicators. The same situation could be observed from the model (II) however, in the third model, CEE indicated lower level of significance comparing to previous two models. On the other hand, Structural Capital Efficiency showed high level of statistical significance opposing to results of other models. As can also be seen from the table the HCE is statistically insignificant within all three econometric models even though it is the component of VAIC with the highest contribution. The nature of an association among variables is positive in all cases.

The independent variables which are significantly associated with explanatory variables have the following level of significance: 10% for CEE within models (I) and (II), and 10% for SCE within the model (III). R^2 for the models I, II and II are 0.26, 0.163 and 0.297 respectively, which means that the explanatory power of variables is 26%, 16,3% and 29,7%. Explanatory power of these models is substantially higher than those where components of VAIC are analyzed separately.

The third part of econometric analysis consists of three models which were also tested for the appropriate specification. The resulted specification, after the tests were conducted, was the

following: Fixed Effects regression for models with Gross Margin and ROI, as dependent variables, and pooled regression for the model with the Sales per Employee performance indicator were the most adequate models. One of the explanations is that in models with Gross Margin and ROI might be omitted variables which are correlated with the variables in the model thus fixed effects model might provide means for controlling for omitted variable bias. As an example of such omitted variable might be the level of R&D expenses which, according to Chen *et al*. (2005) is positively related with firms' performance. At the same time, neither FE nor RE models appeared appropriate for the third model which include SPE as a dependent variable. For the third model pooling regression is the most adequate specification. The explanation for this result could be derived from the assumption about individual-specific effect - c_i of pooling regression equation, which equals zero (Schmidheiny and Basel, 2011). In other words, it indicates that in the third model, where the Sales per Employee performance indicator is a dependent variable, there are no omitted variables which are correlated with the observed explanatory variable or SPE in our case. As a result, it could be concluded that SPE depends only on VAIC components.

As a result of linear multiple regressions from the first part of the study the following hypothesis had been confirmed: **Hypothesis H1** except for H1c., **Hypothesis H2** except for H2c., and each hypothesis within **Hypothesis H3.** Speaking about **Hypothesis H4**, it might be seen that when considering ICE as a summary of HCE and SCE the results are close. The results of correlation analyses within HCE and SCE as independent variables, in all models they indicated high level of correlation to performance and the nature of this relationship is positive in all cases. Almost identical results showed the analysis of ICE with the only exception that the Model II, where ROI is a dependent variable, appeared statistically insignificant. In this case only hypothesis H4b is rejected, while H4a and 4Hc are confirmed.

Overall it was indicated that elements of VAIC when studied individually, are significantly correlated with the indicators of a performance of firms within the retail industry. Only CEE component showed no correlation with ROI and gross margin, thus it may be assumed that the efficient deployment of financial resources such as physical and financial capital of a company has no impact on a performance of Retail companies, namely on ROI and gross margin. Speaking of an influence of IC on a performance within the models which include all of the coefficients the results are mixed. Some VAIC components lost its significance, such as HCE and partly SCE, while CEE increased.

Even though, each component of VAIC was analyzed individually, in reality VAIC and IC represents an integral unit of measure and all their components operate jointly. The suggested

Hypothesis H5, in which all components of VAIC are assessed altogether and which proposes that VAIC has a direct positive impact on financial performance of enterprises in Retail industry, was partially accepted. The regression analysis indicated only one significant component of VAIC which influences firm's performance in models I and II. This component is CEE and it is significant in all three models, despite the results of previous regression analyses in which CEE was significant only in model with gross margin. The increased significance of financial and physical capital efficiency measure could be explained by the addition of other components of VAIC in the model. It is evident that the financial capital produces value in cases when physical assets are properly managed by employees of a firm and firms within the retail industry is not an exception. The opposite results demonstrated an HCE metric, which appeared insignificant in all models after the addition of other two VAIC measures, namely SCE and CEE. It might be proposed that in the modern age employees within retail firms are losing its importance to firms' digital infrastructure. Another assumption could be that the number of temporary workers within the workforce of retailers is growing thus companies do not invest proper sums of money in employee training and education. The third component of VAIC might represent a strengthening argument in favor of the assumption that the importance of firms' infrastructure within the retail industry is growing (KPMG, 2018). This component is SCE, which includes the efficient utilization of firm's infrastructure, namely databases, technological tools and applications, software, automation technologies, etc. SCE pointed significance only in model (III), in which VAIC component appeared significantly related to Sales per Employee indicator. SPE is the only performance indicator which directly includes the productivity of personnel. Since SCE is the metric of the efficiency of supportive infrastructure which assists employees in their day-to-day activities, the high level of correlation between SCE and SPE is well founded.

A summary table with the results of stated hypotheses is presented below:

Table 10

Regression results: Hypotheses

	Hypothesis H1	**Hypothesis H2**	**Hypothesis H3**	**Hypothesis H4**	**Hypothesis H5**
Variable	*HCE*	*SCE*	*CEE*	*ICE*	*HCE+SCE+CEE*
Gross Margin	+	+	-	+	CEE
ROI	+	+	-	+	CEE
SPE	+	+	+	+	SCE, CEE

The main managerial implications of the study suggest managers within such knowledge-intensive industry as Retail, to concentrate more on upgrading company's infrastructure,

processes and databases which should well for employees and customers. It can be achieved by the implementation of appropriate practices and tools that assure the efficient acquisition, creation and documentation of knowledge among the workforce of a company. Moreover, with the purpose of improving the performance, it is vital to focus on the creation of convenient and efficient information systems, the development and application of mechanisms and tools for enhancing cooperation and information transfers among the employees. Consequently, Structural Capital management is essential for ensuring that this capital is appropriately utilized and leveraged with an aim to secure loyal customers and suppliers, and sustainable competitiveness with its connected sustained profitability.

CONCLUSIONS

The goal of the research was to identify the nature of relationship between the intellectual capital (IC) and its components and company's performance indicators, which include Gross Margin, Return on Investments and Sales per Employee. The research starts with the examination of the definition of Intellectual Capital and its components with the help of the previous studies. After the IC analysis, the study and comparison of the existed methodologies of IC measurement was provided and the most applicable according to the purpose of the study was selected. The study continued with the brief overview of Retail industry and its trends. After that, the identification of performance indicators of the Retail industry presented and the ones which might have a connection to a IC of retailers were chosen. Afterwards, the empirical investigation on the relationship between IC and performance indicators was performed and the hypotheses were proposed. Through the empirical study the methodology of the study was formulated and the regression analysis was conducted. In the end of the study, some recommendations were proposed with the purpose of efficient utilization of IC in enhancing firm's performance.

In the first chapter, an overview of the definitions of IC and its three components, i.e. Human, Structural and Relational Capital were presented. In the following part, four categories of IC measurement approaches were defined and compared on the basis of their strengths and weaknesses. The comparison helped to give preference to only those two methods which are most suitable for qualitative testing. After that, all the models of IC measurement within these two methods were examined and compared in the form of a table. As a result, Value Added Intellectual Coefficient was chosen for an empirical study. Thereafter, the VAIC methodology was explicitly studied, its calculation was presented as well as the literature review on the criticism and an application of the methodology.

In the second part of the chapter, an overview of the Retail industry was given and the performance indicators were examined. Besides, the main types of retailers were observed and the retail industry trends were presented. As a result of performance indexes selection, Gross Margin, Return on Investments and Sales per Employee were chosen for a regression analysis. In the end of the chapter, the core hypotheses were formulated.

In the second chapter, the methodology of empirical analysis of the relationship between IC and performance indicators was formulated and several models for a regression analysis were composed. In accordance with the stated hypotheses an empirical analysis was conducted.

As it was hypnotized, in a such industry as Retail, Intellectual Capital has positive influence on a performance of companies. When studied separately, almost all of the VAIC

components influence performance of firms. The only component of IC with no influence on performance metrics except for one case is a Capital Employed Efficiency. It was assumed that the absence of impact of this component is conditioned by its nature. This component represents physical assets of a company and such assets generate value only when properly managed by employees. This proposition was confirmed when other VAIC parts were added to the model, including HCE, which represents the efficiency of employees. In case of joint analysis, CEE showed positive relationship to all indicators of performance.

The opposite situation demonstrated HCE, which was insignificant in all models when studied with other VAIC components. It might be explained by the latest trends in retail, when employees are becoming less important than firms' digital infrastructure. In favor of this assumption may advocate the third component of VAIC, namely Structural Capital Efficiency which consists of the efficient utilization of firm's infrastructure, namely databases, technological tools and applications, software, automation technologies, etc. Though, it showed significance only in model with the Sales per Employee indicator, this indicator is by nature represents the efficiency of personnel and it is the only such indicator in the model. Moreover, as we know from the definition of Structural Capital, it is a supportive infrastructure of the labor force of a firm. Thus, the correlation between SCE and SPE is well defined.

Research findings are potentially useful for managers of Retail enterprises. Based on the obtained results, it could be suggested to managers of retail firms to concentrate on the improvement and maintenance of firms' structural capital. It could be done by the modernization of company's digital infrastructure, processes and databases and the creation of efficient information systems and tools for the enhancement of employees' cooperation and efficiency.

Speaking about the limitations and directions for further research. It should be mentioned that the current research based on the data of the large US Retail companies. Medium and small enterprises might be studied within the US Retail sector and they might show other results. Moreover, the Retail industry within other countries could be examined. In addition, the other performance indicators might be employed in the research. All these data changes might lead to other results and conclusions bringing more contribution to studies devoted to IC and firm performance.

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Appendix 1. List of Companies Used

#	Company name	Category	Subcategory (speciality)
1	Wal-Mart	General Retailer	Hypermarket/Supercenter/Superstore
2	Costco	General Retailer	Cash & Carry/ Warehouse club
3	The Kroger Company	Food and Drug retailer	Supermarket
4	Walgreens Boots Alliance	Food and Drug retailer	Drug Store/Pharmacy
5	Home Depot	General Retailer	Home Improvement
6	Target	General Retailer	
7	Lowe's Companies Inc	General Retailer	Home Improvement
8	Best Buy	General Retailer	Other Specialty (Consumer electronics)
9	TJX Companies	General Retailer	Apparel/Footwear Specialty
10	Kohl's	General Retailer	Department Store
11	The Gap	General Retailer	Apparel/Footwear Specialty
12	Dollar Tree Inc	General Retailer	Discount Store
13	Whole Foods Market	Food and Drug retailer	Supermarket
14	Nordstrom	General Retailer	Department Store
15	L Brands (Limited Brands)	General Retailer	Apparel/Footwear Specialty
16	Ross Stores	General Retailer	Apparel/Footwear Specialty
17	AutoZone. Inc	General Retailer	Other Specialty (Auto parts retailer)
18	Advance Auto Parts	General Retailer	Other Specialty (Automotive parts and accessories)
19	American Eagle Out tters. Inc.	General Retailer	Apparel/Footwear Specialty
20	GameStop Corp	General Retailer	Other Specialty (Video game, consumer electronics, and wireless services)
21	O'Reilly Automotive. Inc.	General Retailer	Other Specialty (Auto parts retailer)
22	Foot Locker. Inc.	General Retailer	Apparel/Footwear Specialty
23	Dick's Sporting Goods. Inc.	General Retailer	Other Specialty (Sporting Goods)
24	The Sherwin-Williams Company	General Retailer	Home Improvement

25	Tractor Supply Company	General Retailer	Home Improvement
26	Big Lots. Inc.	General Retailer	Discount Store
27	Ascena Retail Group. Inc.	General Retailer	Apparel/Footwear Specialty
28	Ralph Lauren Corporation	General Retailer	Apparel/Footwear Specialty
29	Tiffany & Co.	General Retailer	Other Specialty (Luxury jewelry and specialty retailer)
30	ULTA BEAUTY INC	General Retailer	Other Specialty (Beauty retailer)
31	Ingles Markets. Inc.	Food and Drug retailer	Supermarket
32	Sprouts Farmers Market. Inc.	Food and Drug retailer	Supermarket
33	SMART & FINAL	Food and Drug retailer	Cash & Carry/Warehouse Club